MSFC SSM/I Geophysical Product Data Sets

Summary

This README file contains information on the structure of the MSFC SSM/I Geophysical Product Data Sets, instructions for accessing the Hierarchical Data Format (HDF) library, and pertinent scientific references.

Table of Contents:

1. Introduction

This README file contains information on the Special Sensor Microwave Imager (SSM/I) Geophysical Products produced, using Wentz's SSM/I Benchmark Pathfinder Algorithm, at the Global Hydrology Resource Center (GHRC). From the brightness temperature swath data, the GHRC generates three geophysical products at swath and gridded resolutions. These three oceanic geophysical products are produced from data recorded by SSM/I measurements from the Defense Meteorological Satellite Program (DMSP) F-10 (failed on November 14, 1997), F-13, F-14, and F-15 satellites. The parameters are measured between the ocean surface and the top of the atmosphere. Passes are produced at the resolution of the low frequency SSM/I channels while the gridded data is at 0.5 degree resolution. Browse images of the gridded files are also created. The three products are:

- 4.1 Integrated Water Vapor (IWV)

The GHRC has been processing and archiving SSM/I data since 1990. Prior to May 1995, the SSM/I data source for the GHRC was the National Environmental Satellite Data and Information Service (NESDIS). Since May 1995, the source has been the Fleet Numerical Meteorology and Oceanography Center (FNMOC). Data is obtained from FNMOC and processed at the GHRC within hours of its reception. Each day, full resolution swath or "pass" brightness temperatures (Tb's) and reduced resolution "gridded" data sets are generated and stored in HDF files. Browse images of the gridded files are also created in both HDF raster8 and GIF formats. HDF represents the Hierarchical Data Format, the data format standard for NASA's Earth Observing System Data and Information System (EOS-DIS).

2. Processing Steps

2.1 Data Acquisition

The source of the GHRC's SSM/I data is the Navy's Fleet Numerical Meteorology and Oceanography Center (FNMOC). FNMOC is the Department of Defense's (DOD) center of expertise for DMSP passive microwave data processing. The DOD has an agreement with the National Oceanographic and Atmospheric Administration (NOAA) under which they share data via the Shared Processing Network (SPN). FNMOC generates SSM/I antenna temperature files known as Temperature Data Records (TDR's) and sends them to NOAA/NESDIS. NESDIS performs minimal file unpacking and makes the data available to the GHRC. Files are usually available within 1 hour of data acquisition by FNMOC.

2.2 Data Quality Control

Most of the quality control for these products is done as the brightness temperatures are being produced. See the README file for the MSFC Brightness Temperature data for more details. Each day the GHRC performs quality assurance checks on the raw SSM/I antenna temperatures from FNMOC. These are to verify that:

- the scan start times are accurate and dependable
- previously recorded data is not used
- poorly geolocated scans are flagged
- bad lat/lon values and associated data are flagged
- brightness temperatures calculated from bad calibration are flagged

The purpose of these QC steps is to produce a dependable, stable brightness temperature data set and to ensure that only "good" brightness temperatures are used in calculating the geophysical products.

2.3 Data Processing-Swath Data

Swath files are classified as either ascending (from the south pole to the north pole) or descending (from the north pole to the south pole). After the above listed QC steps are performed, brightness temperature (Tb) and geolocation data are read sequentially for each swath file for an entire day. Three geophysical products are generated from each of the MSFC SSM/I brightness temperature ascending and descending swath data files.

2.3.1 Gridded Data

For each day, all of the swath files containing ascending swaths are averaged into a 0.5 x 0.5 degree global grid (720 x 360). The same is separately done for all descending swaths. The global grids are centered on the Greenwich meridian. Each grid box value is the mean of the geophysical product values located within the half degree box centered at every xx.25 and xx.75 degrees. Only valid (positive) geophysical product values are used. Table 1 lists some representative grid points and their geographic extents.

Table 1

Array Coords. (Y,X)	*Centered at Earth Coords.*	*Latitude Extent Earth Coords.*	*Longitude Extent Earth Coords.*
1, 1	89.75,-179.75	90.00 - 89.51	-180.00 - -179.51
180,360	0.25, -0.25	0.50 - 0.01	-0.50 - -0.01
181,360	-0.25, -0.25	0.00 - -0.49	-0.50 - -0.01
181,361	-0.25, 0.25	0.00 - -0.49	0.00 - 0.49
180,361	0.25, 0.25	0.50 - 0.01	0.00 - 0.49
360,720	-89.75, 179.75	-89.50 - -90.00	179.50 - 179.99

2.3.2 Browse Images (HDF,GIF)

Browse files are created from daily gridded HDF products files. Two formats are used; GIF and HDF raster8. For each day the HDF raster8 file contains an image for both the ascending and descending orbits (for each product). For each day there are two GIF files created for each product, one for the ascending passes and one for the descending passes.

Both the HDF raster8 image and the GIF images are created from the HDF gridded data files. The images have been annotated. Also, the coastal boundaries have been color coded.

3. File Naming Convention and Contents

There are 4 types of files produced for each day for each geophysical product (IWV, CLW, and OWS). The 4 types are swath HDF data file, gridded HDF data file, HDF raster8 image file, and GIF image file. The HDF raster8 image file and the GIF image file are both created from the gridded HDF data file. Below is the naming convention and contents for each type of file. The HDF type files have been compressed using "gzip." To uncompress the files use Unix "gunzip”. There are several Windows and Mac software packages that handle gzipped files.

3.1 Swath HDF Data File

For each day, the swath data files (all ascending and all descending files) are created for each of the 3 geophysical products from the MSFC SMM/I brightness temperature swath files.

3.1.1 File Naming Convention

The swath file naming convention is:

`f`*`xx_pppV_yyddd_ssZ`*`.hdf.gz`

where	*xx*	is the satellite ID number (10-15)
	ppp	is the geophysical product code (iwv, ows, or clw)
	V	is the algorithm version letter (a-z)
	yyddd	is the date; year (yy) and day (ddd)
	ss	is the swath number (01-29)
	Z	is the swath direction (A-ascending or D-descending)
	`hdf`	since it is an HDF file
	`gz`	since it has been compressed using the "gzip" utility

For example, the file "f10_iwva_95139_05D.hdf.gz" contains F10 integrated water vapor (algorithm version a) data from the 5th swath (descending) of day 95139. The corresponding geolocation data for this swath is in "f10_ln_95139_05D.hdf.gz."

3.1.2 File Content

The HDF swath files contain data grouped in structures called "objects". Table 2 lists the objects in the HDF swath files. The dimension 'N' represents the number of B-scans in the swath, normally 785 - 808, and can be retrieved with a HDF library call. All objects are filled with missing scans where needed. HDF labels are provided with each object.

Table 2

Description	*units*	*Scale*	*format*	*type*	*size*
Day number	day	1	ddd	integer*2	(1 x N)
Time of day	seconds	1	sssss.ssss	real*4	(1 x N)
Geophysical product	vary	1	tt.ttt	real*4	(64 x N)
Spacecraft position				real*4	(5 x N)
-Time(Minute vector)	seconds	1	sssss.s		
-Latitude	degrees	1	ddd.dd		
-Longitude	degrees	1	ddd.dd		
-Altitude	meters	1	dddddd.		
-Incidence Angle	degrees	1	dd.dd		
Two-line element set	vary	NA	c	integer*1	(69 x 2)
McIDAS Nav. directory	vary	NA	xxxxxx	integer*4	(1 x 128)

In the Spacecraft Position Vector array, missing scans are flagged with -999.0. Since the values are floating point, no scaling is done. Times are in seconds (to the nearest half second), latitudes range from 0.00 to 180.00 degrees, longitudes are positive east from -180.00 to 180.00 degrees, and altitudes are in whole meters.

The two-line element set (object #5) contains a two-line formatted group of ephemeris values closest in time to 1200 UTC of the day being processed. The GHRC retrieves two-line element sets daily. The McIDAS Navigation directory (object #6) is for use with McIDAS software.

3.2 Gridded HDF Data File

For each day there is one HDF gridded data file created for each of the 3 geophysical products. Each file contains two objects – the ascending swath grid and the descending swath grid.

3.2.1 File Naming Convention

The file naming convention for the gridded HDF files is:

`f`*`xx`*`_`*`pppV`*`_`*`yyddd`*`_dayAD.hdf.gz`

where	*xx*	is the satellite ID number (10-15)
	ppp	is the geophysical product code (iwv, ows, or clw)
	V	is the algorithm version letter (a-z)
	yyddd	is the date; year (yy) and day (ddd)
	`hdf`	since it is an HDF file
	`gz`	since it has been compressed using the "gzip" utility

For example, the file "f10_owsa_95155_dayAD.hdf.gz" contains gridded F10 oceanic wind speeds (algorithm version a) for day 95155. The 'AD' in the file name represents the fact that the ascending and descending swaths are computed separately and placed in different objects.

3.2.2 File Content

Table 3 lists the objects in the HDF files and their contents.

Table 3

Description	*units*	*scale*	*format*	*type*	*size*
pppV ascending grid	vary	1	ttt.ttt	real*4	(360 x 720)
pppV descending grid	vary	1	ttt.ttt	real*4	(360 x 720)
Metadata	vary			integer*4	(31 x 512)

where ppp is the geophysical product code (iwv, ows, or clw) and V is the algorithm version letter.

3.2.3 Data Values

The geophysical product data in the gridded HDF files are stored as real*4. Table 4 shows possible values.

Table 4

Value	*Represents*
-10.	Missing
-9.	Flagged due to bad calibration or Tb out of range 50-325K
-6.	Coast
-4.	Possible Ice
-3.	Ice
-2.	Near Coast
-1.	Land
>= 0.	Valid product value

3.3 Browse files (HDF and GIF)

Both the HDF raster8 image and the GIF images are created from the HDF gridded data files. The images have been annotated. Also, the coastal boundaries have been color coded.

3.3.1 File Naming Conventions

3.3.1.1 HDF Raster8 Images

The file naming conventions are:

`fxx_pppV_yyddd_dayAD.ras8.hdf`

where *xx* is the satellite ID number (10-15)
ppp is the geophysical product code (iwv, ows, or clw)
V is the algorithm version letter
yyddd is the date; year (yy) and day (ddd)
`hdf` since it is an HDF file

HDF Raster8 files are in the HDF 8-bit raster image format. They each contain two 8-bit raster images, two palettes (the same), and a file description (metadata).

3.3.1.2 GIF Images

The file naming conventions are:

`fxx_pppV_yyddd_dayZ_ras8.gif`

where *xx* is the satellite ID number (10-15)
ppp is the geophysical product code (iwv, ows, or clw)
V is the algorithm version letter
yyddd is the date; year (yy) and day (ddd)
Z is the swath direction (A-ascending or D-descending)
gif since it is a GIF image

4. Geophysical Product Files

The GHRC generates three geophysical products at swath and gridded resolutions. These three oceanic geophysical products are produced, using Wentz's SSM/I Benchmark Pathfinder Algorithm, from data recorded by SSM/I measurements from the DMSP F-10, 11, 13, 14, & 15 satellites. The parameters are measured between the ocean's surface and the top of the atmosphere. The three products are:

- 4.1 Integrated Water Vapor (IWV)
- 4.2 Cloud Liquid Water (CLW)
- 4.3 Oceanic Wind Speed (OWS)

4.1 Integrated Water Vapor (IWV)

Integrated water vapor is defined as the total amount of non-precipitating water vapor from the ocean surface to the top of the atmosphere. Where results are not attainable the FNMOC surface type (negated) is assigned. For the Integrated Water Vapor ocean product, the brightness temperature (Tb) data is read from the HDF Tb swath files and is then converted back to antenna temperatures (Ta) with the along-scan bias and satellite inter-calibration (if any) included. The Ta's are modified to include Wentz' radiative transfer model offsets.

4.1.1 Integrated Water Vapor Algorithm Information

Algorithm:	Integrated Water Vapor
Algorithm Developer:	F. Wentz - Remote Sensing Systems
SSM/I channels used:	V22, V37, H37 (50-325 K only)
Other input:	Average sea surface temperature Instrument incidence angle
Valid over:	Water only (calibrated for salt water)
Units:	grams per square centimeter (g/cm**2)
Valid Range:	0. - 10. g/cm**2

4.1.2 Integrated Water Vapor Data Values

The integrated water vapor data in the HDF files are stored as real*4, ranging from -33.0 to 10.0. Negative values represent flagged data while positive values represent valid data. Table 5 shows all possible values.

Table 5

Value	*Represents*
-33.	Questionable latitude and/or longitude scan-pair
-22.	Mislocated scan-pair
-21.	Questionable pixels due to geolocation error
-11.	Missing scan-pair
-9.	Flagged due to bad calibration or Tb out of range 50-325K
-6.	Coast
-4.	Possible Ice
-3.	Ice
-2.	Near Coast
-1.	Land
0. - 10.	Integrated Water Vapor values (not scaled)

4.2 Cloud Liquid Water (CLW)

Cloud liquid water is defined as the total amount of non-precipitating liquid water from the ocean surface to the top of the atmosphere. Where results are not attainable the FNMOC surface type (negated) is assigned. Note, since the FNMOC surface type code for land is zero, land codes are included with vegetated land codes and have a value of -1. For the Cloud Liquid Water ocean product, the brightness temperature (Tb) data is read from the HDF Tb swath files and is then converted to antenna temperatures (Ta's) with the along-scan bias and satellite inter-calibration (if any) included. The Ta's are modified to include Wentz' radiative transfer model offsets.

4.2.1 Cloud Liquid Water Algorithm Information

Algorithm:	Cloud Liquid Water
Algorithm Developer:	F. Wentz - Remote Sensing Systems
SSM/I channels used:	V22, V37, H37 (50-325 K only)
Other input:	Average sea surface temperature Instrument incidence angle
Valid over:	Water only (calibrated for salt water)
Units:	milligrams per square centimeter (mg/cm**2)
Valid Range:	0. - 1000. mg/cm**2

4.2.2 Cloud Liquid Water Data Values

The cloud liquid water data in the HDF files are real*4, ranging from -33.0 to 1000.0. Negative values represent flagged data while positive values represent valid data. Table 6 shows all possible values.

Table 6

Value	*Represents*
-33.	Questionable latitude and/or longitude scan-pair
-22.	Mislocated scan-pair
-21.	Questionable pixels due to geolocation error
-11.	Missing scan-pair
-9.	Flagged due to bad calibration or Tb out of range 50-325K
-6.	Coast
-4.	Possible Ice
-3.	Ice

-2.	Near Coast
-1.	Land
0. - 1000.	Cloud liquid water values (not scaled)

4.3 Oceanic Wind Speed (OWS)

Oceanic wind speed is defined as the wind speed just above the ocean surface. Where results are not attainable the FNMOC surface type (negated) is assigned. Note, since the FNMOC surface type code for land is zero, land codes are included with vegetated land codes and have a value of -1. For the Oceanic Wind Speed ocean product, the brightness temperature (Tb) data is read from the HDF Tb swath files and then is converted to antenna temperatures (Ta's) with the along-scan bias and satellite inter-calibration (if any) included. The Ta's are modified to include Wentz' radiative transfer model offsets.

4.3.1 Oceanic Wind Speed Algorithm Information

Algorithm:	Wind Speed (over Oceans)
Algorithm Developer:	F. Wentz - Remote Sensing Systems
SSM/I channels used:	V22, V37, H37 (50-325 K only)
Other input:	Average sea surface temperature Instrument incidence angle
Valid over:	Water only (calibrated for salt water)
Units:	meters per second (m/s)
Valid Range	0. - 40. m/s

4.3.2 Oceanic Wind Speed Data Values

The oceanic wind speed data in the HDF files are real*4, ranging from -33.0 to 40.0. Negative values represent flagged data while positive values represent valid data. Table 7 shows all possible values.

Table 7

Value	*Represents*
-33.	Questionable latitude and/or longitude scan-pair
-22.	Mislocated scan-pair
-21.	Questionable pixels due to geolocation error
-11.	Missing scan-pair

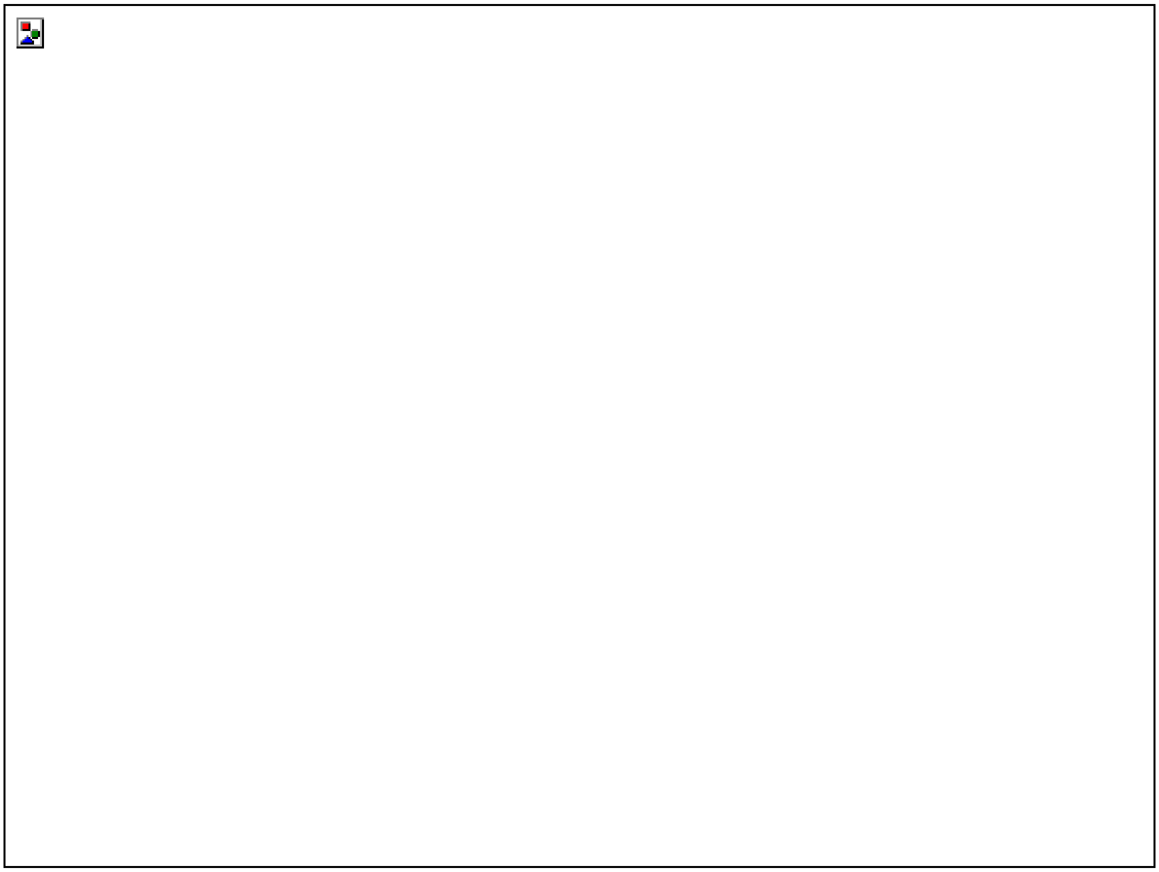
-9.	Flagged due to bad calibration or Tb out of range 50-325K
-6.	Coast
-4.	Possible Ice
-3.	Ice
-2.	Near Coast
-1.	Land
0. - 40.	Oceanic wind speed values (not scaled)

5.File Access

SSM/I data processed by the GHRC are available online via the GHRC Home Page (click on the PM-ESIP folder on the ***Dataset List*** page and click on the **browse** icon beside any of the **MSFC SSM/I** datasets.)
You may use FTP to go directly to the anonymous ftp site. The ftp address is

ghrc.msfc.nasa.gov

Use `anonymous` as the Username and your e-mail address as the password. If you'd like to use your browser to go there now, click here. There is a "data" portion of the server containing swaths and gridded data and a "browse" portion containing GIFs and HDF-raster8 files. The directory structure follows. The numbers in parentheses show the number of days kept on-line.



5.1 Sample Program to Read Files

Two sample FORTRAN program have been provided to read swath and gridded geophysical product data. *read_ssmi_px.f* is for reading geophysical product swath files while *read_ssmi_px_grid.f* is for reading geophysical product grid files. They will read a file and fill arrays containing various data and metadata. The HDF software library is required (see below).

6. Contact Information

For more information or to obtain data, contact:

Global Hydrology Resource Center (GHRC)
Global Hydrology and Climate Center
320 Sparkman Dr.

Huntsville, Alabama 35805
phone: (256) 961-7932
fax: (256) 961-7859
email: ghrc@eos.nasa.gov

7. HDF Library and Tools

7.1 Hierarchical Data Format

HDF is a library and platform independent data format for the storage and exchange of scientific data. It includes Fortran and C calling interfaces, and utilities for analyzing and converting HDF data files. HDF is developed and supported by the National Center for Supercomputing Applications (NCSA) and is available in the public domain (http://hdf.ncsa.uiuc.edu/). HDF stands for Hierarchical Data Format. It is a multi-object file format for the transfer of graphical and numerical data between machines. HDF is a portable file format. HDF files can be shared across platforms. An HDF file created on one computer, say a Silicon Graphics Indy (SGI), can be read on another system, say IBM PC, without modification.

7.2 How to Obtain the HDF Library

The HDF library and tools for your platform can be downloaded from the World Wide Web at:

http://hdf.ncsa.uiuc.edu/

Follow the instructions given there.

7.3 Visualization Software

The HDF files were created using HDF version 3.3, release 4. There are many visualization software packages that work with HDF files.

The GIF images may be viewed by most popular GIF image viewers.

8. References

Hollinger, J., et al., *DMSP Special Sensor Microwave / Imager Calibration / Validation Final Report Volume I*, Naval Research Laboratory, Washington, D. C.,20 July 1989.

Wentz, Frank J., *Measurement of Oceanic Wind Vector Using Satellite Microwave Radiometers*, IEEE Transactions on Geoscience and Remote Sensing, Vol. 30, No. 5, 5 September 1992.

Wentz, Frank J., *User's Manual SSM/I Antenna Temperature Tapes Revision 1*, RSS Technical Report 120191, Dec. 1, 1991, Remote Sensing Systems, Santa Rosa, CA.

Wentz, Frank J., *User's Manual SSM/I Antenna Temperature Tapes Revision 2*, RSS Technical Report 120193, Dec. 1, 1993, Remote Sensing Systems, Santa Rosa, CA.

Appendix A: Metadata Objects

A.1 Grid Metadata Object

The metadata object of each brightness temperature global grid HDF file contains a 512 X 31 (4-byte integer) word array. The metadata arrays from each swath contained in that daily grid are included in "columns" 1 through 29 while "columns" 30 and 31 contain the metadata arrays for the daily grid (ascending and descending swaths respectively). The definitions for each element of those last two metadata arrays are defined here.

Use of the word "scan" refers to 85 GHz resolution. (I.e., half of an A-B scan-pair)

Element	*Definition*
1	Integer representation of 'SSMI'
2	Satellite ID number (i.e., 8, 10, 11, 12, 13, 14, 15, 16, etc...)
3	Bit representation of swaths present (note: all even or all odd swaths only, since asc/des separated)
4	Total number of swaths present
5	Start date
6	Start time
7	Start latitude at nadir pixel
8	Start longitude at nadir pixel
9-14	Not used
15	End date
16	End time
17	End latitude at nadir pixel
18	End longitude at nadir pixel

19	Not used
20	Number of "good" scans
21	Number of missing scans
22	Number of mis-located scans (buffer problem)
23	Number of mis-located scans (questionable)
24	Total number of scans
25	Number of A-scans with flagged Tb's, calibration and scene related
26	Number of B-scans with flagged Tb's, calibration and scene related
27	Number of flagged V19 values, calibration related
28	Number of flagged H19 values, calibration related
29	Number of flagged V22 values, calibration related
30	Number of flagged V37 values, calibration related
31	Number of flagged H37 values, calibration related
32	Number of flagged V85 values, calibration related
33	Number of flagged H85 values, calibration related
34	Number of flagged V19 values, scene related
35	Number of flagged H19 values, scene related
36	Number of flagged V22 values, scene related
37	Number of flagged V37 values, scene related
38	Number of flagged H37 values, scene related
39	Number of flagged V85 values, scene related
40	Number of flagged H85 values, scene related
41	Number of out-of-bounds latitude values
42	Number of out-of-bounds longitude values
43	Number of spiked latitude values
44	Number of spiked longitude values
45	Number of out-of-bounds surface type values
46	Minimum V19 Tb all (swath) pixels (stored * 100)
47	Minimum H19 Tb all (swath) pixels (stored * 100)
48	Minimum V22 Tb all (swath) pixels (stored * 100)
49	Minimum V37 Tb all (swath) pixels (stored * 100)
50	Minimum H37 Tb all (swath) pixels (stored * 100)
51	Minimum V85 Tb all (swath) pixels (stored * 100)
52	Minimum H85 Tb all (swath) pixels (stored * 100)
53	Maximum V19 Tb all (swath) pixels (stored * 100)
54	Maximum H19 Tb all (swath) pixels (stored * 100)
55	Maximum V22 Tb all (swath) pixels (stored * 100)
56	Maximum V37 Tb all (swath) pixels (stored * 100)

57	Maximum H37 Tb all (swath) pixels (stored * 100)
58	Maximum V85 Tb all (swath) pixels (stored * 100)
59	Maximum H85 Tb all (swath) pixels (stored * 100)
60-63	Not used
64	Time of first valid scan (seconds since 1/1/87 0000 UTC)
65	Time of day (in seconds) of first scan of this browse
66	Fractional part of word 67 (stored * 10000)
67	Time of last valid scan (seconds since 1/1/87 0000 UTC)
68	Time of day (in seconds) of last scan of this browse
69	Fractional part of word 69 (stored * 10000)
70-199	Reserved for future use in the swath files
211	Minimum V19 Tb for the browse pixels (stored * 100)
212	Minimum H19 Tb for the browse pixels (stored * 100)
213	Minimum V22 Tb for the browse pixels (stored * 100)
214	Minimum V37 Tb for the browse pixels (stored * 100)
215	Minimum H37 Tb for the browse pixels (stored * 100)
216	Minimum V85 Tb for the browse pixels (stored * 100)
217	Minimum H85 Tb for the browse pixels (stored * 100)
218	Maximum V19 Tb for the browse pixels (stored * 100)
219	Maximum H19 Tb for the browse pixels (stored * 100)
220	Maximum V22 Tb for the browse pixels (stored * 100)
221	Maximum V37 Tb for the browse pixels (stored * 100)
222	Maximum H37 Tb for the browse pixels (stored * 100)
223	Maximum V85 Tb for the browse pixels (stored * 100)
224	Maximum H85 Tb for the browse pixels (stored * 100)
225	Number of missing (-1) pixels in V19 browse
226	Number of missing (-1) pixels in H19 browse
227	Number of missing (-1) pixels in V22 browse
228	Number of missing (-1) pixels in V37 browse
229	Number of missing (-1) pixels in H37 browse
230	Number of missing (-1) pixels in V85 browse
231	Number of missing (-1) pixels in H85 browse
232-512	Not used

A.2 Swath Metadata Object

The metadata object of each geophysical product swath HDF file contains a 512 (4-byte integer) word array. The definitions for each element of that array is defined here.

Element	*Definition*
1	Integer representation of 'SSMI'
2	Satellite ID number (i.e., 8, 10, 11, 12, 13, 14, 15, 16, etc...)
3	Swath number (1-29)
4	Ascending (=1) or descending (=2) swath
5	Start date
6	Start time
7	Start latitude at nadir pixel
8	Start longitude at nadir pixel
9	Start scan number (should always be 1)
10	Date of equator crossing (first scan at/after)
11	Time of equator crossing (first scan at/after)
12	Latitude at nadir pixel of equator crossing
13	Longitude at nadir pixel of equator crossing
14	Equator scan number
15	End date
16	End time
17	End latitude at nadir pixel
18	End longitude at nadir pixel
19	End scan number
20	Number of "good" scans
21	Number of missing scans
22	Number of mis-located scans (buffer)
23	Number of mis-located scans (questionable)
24	Number of mis-located scans (Wrong_NAV)
25	Total number of scans
26	Number of A-scans w/flagged Tb's, calibration/scene related
27	Number of B-scans w/flagged Tb's, calibration/scene related
28	Number of flagged V19 values, calibration related
29	Number of flagged H19 values, calibration related
30	Number of flagged V22 values, calibration related
31	Number of flagged V37 values, calibration related
32	Number of flagged H37 values, calibration related
33	Number of flagged V85 values, calibration related
34	Number of flagged H85 values, calibration related

35	Number of flagged V19 values, scene related
36	Number of flagged H19 values, scene related
37	Number of flagged V22 values, scene related
38	Number of flagged V37 values, scene related
39	Number of flagged H37 values, scene related
40	Number of flagged V85 values, scene related
41	Number of flagged H85 values, scene related
42	Number of out-of-bounds latitude values
43	Number of out-of-bounds longitude values
44	Number of out-of-bounds surface type values
45	Number of flagged latitude values (due to latitude spikes)
46	Number of flagged longitude values (due to latitude spikes)
47	Number of flagged surface type values (due to latitude spikes)
48	Minimum V19 Tb all pixels (stored * 100)
49	Minimum H19 Tb all pixels (stored * 100)
50	Minimum V22 Tb all pixels (stored * 100)
51	Minimum V37 Tb all pixels (stored * 100)
52	Minimum H37 Tb all pixels (stored * 100)
53	Minimum V85 Tb all pixels (stored * 100)
54	Minimum H85 Tb all pixels (stored * 100)
55	Maximum V19 Tb all pixels (stored * 100)
56	Maximum H19 Tb all pixels (stored * 100)
57	Maximum V22 Tb all pixels (stored * 100)
58	Maximum V37 Tb all pixels (stored * 100)
59	Maximum H37 Tb all pixels (stored * 100)
60	Maximum V85 Tb all pixels (stored * 100)
61	Maximum H85 Tb all pixels (stored * 100)
62	Minimum latitude all pixels (stored * 100)
63	Maximum latitude all pixels (stored * 100)
64	Minimum longitude all pixels (stored * 100)
65	Maximum longitude all pixels (stored * 100)
66	Time of first valid scan (seconds since 1/1/87 0000 UTC)
67	Time of day (in seconds) of first scan of this swath
68	Fractional part of word 67 (stored * 10000)
69	Time of last valid scan (seconds since 1/1/87 0000 UTC)
70	Time of day (in seconds) of last scan of this swath
71	Fractional part of word 70 (stored * 10000)
72	Percentage of FNMOC surface type 0 (Land, stored *10000)

73	Percentage of FNMOC surface type 1 (Veg Land, stored *10000)
74	Percentage of FNMOC surface type 2 (Near Coast,stored *10000)
75	Percentage of FNMOC surface type 3 (Ice, stored *10000)
76	Percentage of FNMOC surface type 4 (Poss Ice, stored *10000)
77	Percentage of FNMOC surface type 5 (Water, stored *10000)
78	Percentage of FNMOC surface type 6 (Coast, stored *10000)
79	Percentage of FNMOC surface type 7 (not used, stored *10000)
80	Lower bound of V19 cold load used to flag due to bad calibration
81	Upper bound of V19 cold load used to flag due to bad calibration
82	Lower bound of V19 hot load used to flag due to bad calibration
83	Upper bound of V19 hot load used to flag due to bad calibration
84	Lower bound of H19 cold load used to flag due to bad calibration
85	Upper bound of H19 cold load used to flag due to bad calibration
86	Lower bound of H19 hot load used to flag due to bad calibration
87	Upper bound of H19 hot load used to flag due to bad calibration
88	Lower bound of V22 cold load used to flag due to bad calibration
89	Upper bound of V22 cold load used to flag due to bad calibration
90	Lower bound of V22 hot load used to flag due to bad calibration
91	Upper bound of V22 hot load used to flag due to bad calibration
92	Lower bound of V37 cold load used to flag due to bad calibration
93	Upper bound of V37 cold load used to flag due to bad calibration
94	Lower bound of V37 hot load used to flag due to bad calibration
95	Upper bound of V37 hot load used to flag due to bad calibration
96	Lower bound of H37 cold load used to flag due to bad calibration
97	Upper bound of H37 cold load used to flag due to bad calibration
98	Lower bound of H37 hot load used to flag due to bad calibration
99	Upper bound of H37 hot load used to flag due to bad calibration
100	Lower bound of V85 cold load used to flag due to bad calibration
101	Upper bound of V85 cold load used to flag due to bad calibration
102	Lower bound of V85 hot load used to flag due to bad calibration
103	Upper bound of V85 hot load used to flag due to bad calibration
104	Lower bound of H85 cold load used to flag due to bad calibration
105	Upper bound of H85 cold load used to flag due to bad calibration
106	Lower bound of H85 hot load used to flag due to bad calibration
107	Upper bound of H85 hot load used to flag due to bad calibration
108	Lower bound of thermistors used to flag due to bad calibration
109	Upper bound of thermistors used to flag due to bad calibration
200	The integer representation for the product

[Use of the following is for 'iwvV', 'clwV', and 'owsV' where V is the algorithm version number]

201	Minimum product value 90N to 30N (stored * 10000)
202	Latitude of minimum product value 90N to 30N (stored * 100)
203	Longitude of minimum product value 90N to 30N (stored * 100)
204	Scan number of minimum product value 90N to 30N
205	Element number of minimum product value 90N to 30N
206	Maximum product value 90N to 30N (stored * 10000)
207	Latitude of maximum product value 90N to 30N (stored * 100)
208	Longitude of maximum product value 90N to 30N (stored * 100)
209	Scan number of maximum product value 90N to 30N
210	Element number of maximum product value 90N to 30N
211	Average product value 90N to 30N (stored * 10000)
212	Total valid data hits 90N to 30N
213	Minimum product value 30N to 30S (stored * 10000)
214	Latitude of minimum product value 30N to 30S (stored * 100)
215	Longitude of minimum product value 30N to 30S (stored * 100)
216	Scan number of minimum product value 30N to 30S
217	Element number of minimum product value 30N to 30S
218	Maximum product value 30N to 30S (stored * 10000)
219	Latitude of maximum product value 30N to 30S (stored * 100)
220	Longitude of maximum product value 30N to 30S (stored * 100)
221	Scan number of maximum product value 30N to 30S
222	Element number of maximum product value 30N to 30S
223	Average product value 30N to 30S (stored * 10000)
224	Total valid data hits 30N to 30S
225	Minimum product value 30S to 90S (stored * 10000)
226	Latitude of minimum product value 30S to 90S (stored * 100)
227	Longitude of minimum product value 30S to 90S (stored * 100)
228	Scan number of minimum product value 30S to 90S
229	Element number of minimum product value 30S to 90S
230	Maximum product value 30S to 90S (stored * 10000)
231	Latitude of maximum product value 30S to 90S (stored * 100)
232	Longitude of maximum product value 30S to 90S (stored * 100)
233	Scan number of maximum product value 30S to 90S
234	Element number of maximum product value 30S to 90S
235	Average product value 30S to 90S (stored * 10000)
236	Total valid data hits 30S to 90S

237	Minimum product value 90N to 90S (stored * 10000)
238	Latitude of minimum product value 90N to 90S (stored * 100)
239	Longitude of minimum product value 90N to 90S (stored * 100)
240	Scan number of minimum product value 90N to 90S
241	Element number of minimum product value 90N to 90S
242	Maximum product value 90N to 90S (stored * 10000)
243	Latitude of maximum product value 90N to 90S (stored * 100)
244	Longitude of maximum product value 90N to 90S (stored * 100)
245	Scan number of maximum product value 90N to 90S
246	Element number of maximum product value 90N to 90S
247	Average product value 90N to 90S (stored * 10000)
248	Total valid data hits 90N to 90S

You can contact user and data services by phone or email using the number or address below:

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